REMARKS ON DR. CHAPMAN'S NOTE ON RADIO FADE-OUTS AND THE ASSOCIATED MAGNETIC DISTURBANCES

This letter is by way of an addendum to the communication of Professor S. Chapman[1] and the further communication by S. S. Kirby[2] which it prompted.

Mr. Kirby has given a useful analysis of the steps by which the relations between radio fade-outs and their associated solar and magnetic disturbances have been gradually elucidated during the last two and a half years by American workers, but the story seems to me to be incomplete, since no mention is made of the work of Mögel, the pioneer investigator of such matters.

In a paper published as early as 1930, Mögel[3] gives an analysis of what he calls "short disturbances", encountered in short-wave communication during the last sunspot-maximum period. Mögel, with a wealth of illustrative data, describes the characteristic sudden start of such fade-outs with the recovery for all stations within about an hour. He also shows that they occur only on the illuminated side of the Earth, and that they are frequently accompanied by characteristic variations of the horizontal component of the Earth's magnetic field, although the day in question may be otherwise classed as magnetically quiet. He suggests that the radio and magnetic effects are due to abnormal ionization of the lower layers of the atmosphere.

Attention has already been drawn by Dr. J. Bartels[4] to the classical instance of the association of a bright solar eruption observed by Carrington on September 1, 1859, and the small simultaneous magnetic disturbance disclosed by the Kew Observatory records, but it would scarcely be permissible to deduce from this single example and the work of Mögel the complete association of the three phenomena, fade-out, bright eruption, and magnetic disturbance. Such association has been satisfactorily established only as the result of the work of Dellinger, Jouaust, Fleming, Richardson, Newton, McNish, Torreson, Scott and Stanton, and Berkner and Wells.

Mr. Kirby's account of the early work on ionospheric perturbations associated with magnetic storms is likewise incomplete. That magnetic storms are usually accompanied by low region F_2 maximum electron-density and an inflated higher atmosphere was announced in *Nature* on October 5, 1935,[5] the deductions being made from an analysis of data for the whole year of 1934. Mr. Kirby's first reference citation[6] deals with a letter to the *Physical Review* on November 15, 1935, dealing independently with the single instance of a magnetic storm occurring on October 24, 1935. The important work of Harang[7] in Norway on this subject might well have been mentioned in Mr. Kirby's list.

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[1] Terr. Mag., **42**, 417-419 (1938).

[2] Terr. Mag., **42**, 420 (1938).

[3] Telefunken-Ztg., **11**, 14-31 (1930).

[4] Terr. Mag., **42**, 235-239 (1937).

[5] E. V. Appleton and L. J. Ingram, Nature, **136**, 548-549 (1935).

[6] S. S. Kirby, T. R. Gilliland, E. B. Judson and N. Smith, Phys. Rev., **48**, 849 (1935).

[7] L. Harang, Beitr. Geophys., **46**, 438-454 (1936).